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METHOD AND SYSTEM OF PROGRAM MANAGEMENT FOR USING  
COMPONENT MODEL

BACKGROUND OF THE INVENTION

This invention relates to a distributed object technology on the basis of a component model.

An information processing system constituted  
5 by utilizing the distributed object technology is called a "distributed object system".

In this distributed object system, objects that are mounted in accordance with a predetermined rule for re-use are called "components". Since the  
10 components are re-usable, they can be sold and purchased as commercial parts. A system that constitutes a system by re-use of the components is called a "component model".

In the system based on the component model, a  
15 program offering a service activates the component, and a program utilizing a service calls the component. A desired processing is thus achieved. Here, the program providing the service is called a "service providing program" and the program utilizing the service, a  
20 "service utilization program".

One of the problems in the system based on the component model is how the service utilization program acquires an identifier for calling an object or a component. Here, the identifier for calling the  
25 object or component is called "reference information".

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The object that the service utilization program utilizes for acquiring the reference information of the component is called a "home".

The first known example is described, for  
5 example, in "Enterprise JavaBeans Specification", V1.1  
(1999) published by Sun Microsystems Inc., U.S.A.  
("Enterprise JavaBeans" is the registered trademark of  
Sun Microsystems, Inc.). In this example, the  
component is called "Enterprise Bean" and the home,  
10 "EJBHome".

The second known example is described, for example, in "CORBA Components" Vol. 1: Joint Revised Submission, (Aug. 2, 2000) published by Object Management Group, a standardization organization in U.S.A. Here, CORBA (Common Object Request Broker Architecture) represents a distributed object technology described in "The Common Object Request Broker: Architecture and Specification", Revision 2.0 (1996) published by Object Management Group. (CORBA is the registered trademark of Object Management Group).

## SUMMARY OF THE INVENTION

In an embodiment obtained by the inventors, a procedure for calling the component by the service utilization program will be explained with reference to Fig. 2. A home 111 and a component 112 correspond to each other on the 1:1 basis. The home 111 holds component reference information 143 as reference

information of the component 112. A naming service 120 is provided so as to manage the correspondence relation of an object name 1131 and reference information 132.

A service utilization program 100 first  
5 passes the object name 131 (ordinary customer, for  
example) of the home 111 (ordinary customer home, for  
example) corresponding to the component 112 (ordinary  
customer component, for example) that is to be called,  
to the naming service 120 and acquires reference  
10 information 132 of the home 111 (ordinary customer  
home, for example). Next, the service utilization  
program 100 calls the home 111 (ordinary customer home,  
for example) by utilizing the reference information 132  
so acquired and acquires the component reference  
15 information 143. The service utilization program 100  
then calls the component (ordinary customer component,  
for example) by utilizing the component reference  
information 143.

As described above, all of the component 112, the home 111 and the object name 1131 registered to the naming service 120 correspond to one another on the 1:1 basis. In order to identify the kind of the component 112 to be called in the service utilization program 100, therefore, an operation manager of the system must manage the identifiability of the object names 1131 corresponding to all kinds of components 112 and must register them in advance to the naming service 120.

As the component model is expected to further

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Now, let us consider the following problems.

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the number of kinds of components to be activated increases, the increase of the number of homes can be restricted. Since the home and the object name to be registered to the naming service correspond to each other on the 1:1 basis, the number of object names registered to the naming service can be decreased, too. Therefore, the operation manager can easily manage the identifiability of the object names used in the overall system, and the management cost can be reduced. Even when any change and addition of components occur, reference information can be acquired from the existing home when the component reference information management area is changed. Therefore, registration information of the naming service need not be managed, and the management cost of the naming service by the operation manager can be reduced.

#### BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 explains an operation principle of the present invention;

Fig. 2 explains an operation principle of an embodiment obtained by the inventors;

Fig. 3 explains a construction of a first embodiment and a flow of its processing;

Fig. 4 explains an operation principle of a second embodiment;

Fig. 5 explains a construction of the second embodiment and a flow of its processing; and

Fig. 6 explains an operation principle of a third embodiment.

#### DESCRIPTION OF THE EMBODIMENTS

Preferred embodiments of the present invention will be explained hereinafter with reference to the accompanying drawings.

Initially, the first embodiment will be explained with reference to Figs. 1 and 3.

This embodiment solves the problem that when a service is diversified, a management cost in a naming service increases. Further, this embodiment solves the problems that when the service is diversified, a memory consumption amount by a home increases, and because the number of object names registered to the naming service increases, the memory consumption amount in the naming service increases.

Fig. 1 shows an operation principle of this embodiment. First, a service utilization program 100 passes an object name 131 to a naming service 120 and acquires reference information 132 of a home 111. At this time, the naming service 120 refers to a name information table 130 representing the list of a correspondence relation between the object name 1131 and the reference information 132. Next, the service utilization program 100 calls the home 111 by utilizing the reference information 132 thus acquired, and acquires component reference information 143. The home

Fig. 3 shows the construction of this embodiment and the flow of its processing.

A request generation unit 300 is the one that generates a home reference information request message 330, a component reference information request message 340 and a request message 350. The request generation unit 300 comprises a CPU 301, a communication network controller 302 and a memory 303. A service utilization program 100 exists on the memory 303. The service



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Next, the flow of processing in this embodiment will be explained.

In the name managing unit 310, the naming service 120 receives the home reference information request message 330. Parameters constituting the home reference information request message 330 contains the object name 131. The naming service 120 refers to the name information management area 311, acquires the reference information 132 corresponding to the object name 131 contained in the request and returns the reference information 132 to the service utilization program 100.

In the request processing unit 320, the home  
111 receives the component reference information

The service utilization program 100 acquires the component reference information 143 from the home 111, generates the request message 350 by use of the request generation control part 306 to call the component 112 and sends it to the request processing unit 320.

message 350. The request message 350 comprises various parameters and holds the component reference information 143 as one of the parameters. The component activation part 323 acquires the component reference information 143 from the request message 350 and calls the corresponding component 112.

As described above, one home manages a plurality of kinds of components corresponding to one interface in this embodiment. Therefore, the increase of the number of homes can be restricted even when the number of kinds of components increases. Here, the home and the object name to be managed by the naming service correspond to each other on the 1:1 basis. In consequence, the number of object names to be managed by the naming service can be reduced. In other words, the operation manager can easily manage the identifiability of the object names used in the system as a whole and the management cost of the naming service can be reduced. Further, even when any change and addition of components occur, the component reference information can be acquired from the existing home by changing the component reference information table. Therefore, the name information table need not be changed, and the management cost of the naming service by the operation manager can be reduced.

Because the increase of the number of homes can be restricted, the use amount of the memory by the home in the request processing unit can be reduced.

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Though the same number of object names as the number of homes must be registered to the naming service, the number of object names registered to the naming service can be restricted when the number of homes is-

5 restricted. Consequently, the number of entries of the name information table can be restricted and the use amount of the memory in the name managing unit can be restricted.

Next, the second embodiment of the present  
10 invention will be explained with reference to Figs. 4 and 5.

To acquire the component reference information, the component kind is explicitly passed in the service utilization program in the first  
15 embodiment. In industrial information systems, however, the component kind may represent the service content. It is therefore preferred in some cases to avoid the exposure of the component kind to outside (service utilization program, for example) from the  
20 aspect of company strategy. When one home manages a plurality of kinds of components, this embodiment solves the problem that the component kind is exposed to the outside of the service offer program.

Fig. 4 shows an operation principle of this  
25 embodiment.

This embodiment manages the correspondence of an interface name 2141, a component kind 142 and a component judgment condition 401 as a component kind

5 The component judgment information 402 is, for example,  
user information (user identifier, user roll,  
information representing authority, user location,  
information representing language used, kind of  
terminal used by user, etc). The home 111 first refers  
10 to the component kind table 400 on the basis of the  
component judgment information 402 it receives (such as  
customer ID = 45) and the interface name 141 it holds  
(customer IF, for example), and acquires the component  
kind 142 (preferential customer, for example)  
15 corresponding to the component judgment condition 401  
(customer ID < 1000, for example). Next, the home 111  
refers to the component reference information table 140  
on the basis of the interface name 141 it holds  
(customer IF, for example) and the component kind 142  
20 it acquires (preferential customer, for example),  
acquires the corresponding component reference  
information 143 (preferential customer component, for  
example) and returns it to the service utilization  
program 100.

In this embodiment, a component kind management area 500 as an area for managing the

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corresponding component kind 142 on the basis of the  
interface name 141 and the component judgment  
information 402 passed, and outputs the component kind  
142. Next, the home 111 passes the interface name 141  
5 it holds and the component kind 142 it acquires to the  
component reference information management part 321,  
and acquires the component reference information 143.  
At this time, the component reference information  
management part 321 refers to the component reference  
10 management area 322, acquires the component reference  
information 143 corresponding to the interface name 141  
and the component kind 142 passed, and outputs this  
component reference information 143. The home 111  
returns the acquired component reference information  
15 143 to the request generation unit 300.

As described above, according to this  
embodiment, the component kind need not be exposed to  
the outside of the service offer program.

Because the user information is utilized as  
20 the component judgment information, the home can select  
the component corresponding to the user, and can  
accomplish "customization" of the service.

Next, the third embodiment of the present  
invention will be explained with reference to Fig. 6.

25 In the first and second embodiments, when the  
home judges the component corresponding to the received  
component reference information request message, it  
utilizes the information (component kind and component



judgment information) passed from the service utilization program as the judgment material.

Therefore, unless the information as the judgment material is contained in the component reference

5 information request message, the home cannot judge the corresponding component from a plurality of kinds of components. This embodiment contemplates to solve the problem that one home can manage only one kind of component in the construction wherein the component  
10 reference information request message does not contain the information as the judgment material, hence the number of homes increases with the increase of the number of components and the memory consumption amount by the home increases.

15 Fig. 6 shows an operation principle of this embodiment.

In this embodiment, the home 111 manages the component judgment information 402. The component judgment information 402 is, for example, date and  
20 hour. When returning the component reference information 143 to the service utilization program 100, the home 111 refers to the component kind table 400 and acquires the component kind 142 (customer V2, for example) corresponding to the component judgment  
25 condition 401 (1/Jan/2000 < = date) on the basis of the interface name 141 (customer IF, for example) it holds and the component judgment information 402 (date = 3/Jan/2001, for example) it manages. The home 111 then

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refers to the component reference information table 140, acquires the component reference information 143 (customer V2 component, for example) corresponding to the interface name 141 (customer IF, for example) it holds and to the component kind 142 (customer V2, for example) it acquires, and returns the component reference information 143 to the service utilization program 100.

In this way, this embodiment manages a plurality of kinds of components by means of one home and can reduce the memory consumption amount by the home even in the construction in which the component reference information request message does not contain the component judgment information.

Because the date and the hour are utilized as the component judgment information, this embodiment can automatically exchange the components without the change of the service utilization program and without re-activation of the service offer program when version-up of the components is executed.

As described above, since one home manages a plurality of kinds of components corresponding to one interface, the increase of the number of homes can be restricted even when the number of kinds of components to be activated increases. Since the home and the object name to be registered to the naming service correspond to each other on the 1:1 basis, the number of object names registered to the naming service can be

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The present invention can thus accomplish appropriate component name management.